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ABSTRACT

Teachers' salary schedules are not ends in themselves; rather, they are linked to the middle-range personnel objectives that include: (1) having a large applicant pool from which to choose; (2) reduced teacher turnover; and (3) increased average teacher experience in the district, with a larger percent of masters' degrees. Salary schedules from 103 Colorado school districts were classified into three variables that represented the teaching experience dimensions of the schedules. A significant relationship between the magnitude of educational incentive and middle-range objectives was found to exist. Periodic salary increases that occur beyond the regular schedule of pay increases positively influence the amount of teaching experience in the district, as does the total number of regular increases in the salary schedule. In turn, the percentage of teachers with the master's degree and the average amount of teacher experience in the district are significant determinants of math and reading achievement in the elementary school and to a lesser degree (but still present) in the high school. (3 tables and 5 footnotes) (KM)

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THE INFLUENCE OF SALARY SCHEDULE VARIABLES ON TEACHER APPLICANT
POOLS, RETENTION, AND ADVANCED DEGREES, AND ON STUDENT
ACHIEVEMENT

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Salary schedules are among the most important school district policy statements since they determine the basic salaries for teachers. Their structure is expressed along two dimensions: the number of years of experience a teacher has in a district, and the amount of education for which a teacher is to be rewarded. Between them, these dimensions control the projected magnitude of yearly reward, once the beginning salary and highest attainable salary have been set.

From a systemic viewpoint, salary schedules are not ends in themselves, but are linked to middle-range or enabling personnel objectives. These objectives include being able to 1) select candidates from a sizeable applicant pool, then 2) retain in the district the teachers one would like to keep, and finally 3) develop a professionally skilled teacher workforce through advanced education.

A widespread belief in education is that if these mid-range objectives can in some degree be attained, student progress as a long-range objective will ultimately be enhanced. One may hypothesize that the specific structure of district salary

schedules is one of the ways attainment of these aims can be influenced. The purpose of the study reported here was to relate variables representing the two dimensions of salary schedules to variables representing the mid-range objectives, and finally to relate both of these to reading and mathematics achievement at the elementary and high school levels.

Data Source and Methods

The salary schedules were drawn from 103 Colorado school districts under intensive study since 1981. Three variables represent the teaching experience dimension of these schedules. First is the number of increments (or yearly steps) for persons who hold only the baccalaureate degree and have no remunerable college credits beyond this degree. It tells how long a district is willing to give increments to persons who do not advance in professionally relevant education. This variable is labeled BASTEPS. The second variable is the use of periodically awarded increments beyond the end of the regular salary schedule. For example, some districts award an increment every fourth year after the end of the regular schedule (which might end, say, at the 14th year) until the 25th year. This policy seems to encourage teachers to remain in the district and also provides some incentive to maintain effort in the later years of teaching experience. This variable is coded 1 or 0 for present or absent, and is labeled SPCDSTPS for "spaced-out steps". The third variable on this dimension is the maximum or total steps

in the regular schedule (TOTSTEPS) under the most favorable condition of advanced education--frequently the doctorate or the Masters degree plus 60 hours. It tells how many regular-interval increments there will be, but does not tell what the magnitude of the increments are.

The fourth variable, that related to the amount-of-education dimension, is "education incentive" (EDUCINC), which represents the dollar difference in salary from the final step in the baccalaureate only schedule (BASTEPS) to the final step in the total schedule under the most favorable condition of advanced education. This variable tells how much the district is willing to pay for the maximum amount of education represented in the schedule.

The mid-range policy objectives were represented by four variables. First, the size of the applicant pool for three positions, secondary English, secondary math, and elementary school grades 1-6, averaged for the years 1981-85, as reported by superintendents by interview in 1986. These three averages for each district were then factor analyzed, and the resulting factor score saved as the operational variable. It was labeled POOL. Second was the average percent of teacher turnover in the district for the years 1981-85 as reported by the superintendent by interview in 1986. This variable is an estimate of the stability of the teacher workforce. It must be viewed with a bit of caution, however, since several superintendents noted that about 15 percent of their positions turned over with some frequency, while the other 85 percent seemed interminably

occupied by the same teachers. The variable was labeled TTURN. The second estimate of stability was the average teaching experience in the district as obtained from the Colorado Department of Education. It was labeled DISTEXP. The fourth variable was the percent of teachers in the district with the Masters degree or beyond. It represents the progress the district has made in developing a professionally skilled teacher workforce through advanced education. It was labeled PCTMA.

The variables representing student achievement as a long-range objective were district-level math and reading scores on standardized tests for grades 5 or 6 and for grades 11 or 12 for the years 1984, 1985 and 1986. The scores, obtained from the Colorado Department of Education, were converted to national percentiles then averaged over the three year period to assure stability of estimates for the elementary and the high schools.

The method for determining the relationships among the variables in the three sets--salary schedule, mid-range objectives, and student achievement--was three sets of least squares multiple regression equations with hypothesis testing at each step in each equation in each set. The first set related the salary schedule variables to the variables representing mid-range objectives; the second set related salary schedule variables to student achievement; and the third set related mid-range objectives to student achievement. In each of these sets certain control variables, known or strongly suspected to influence the criterion variables, were introduced. These control variables are discussed below in relation to particular

equations in which they were utilized.

Results and Interpretations

Relationships of salary schedule to middle-range objectives.

These relationships, with appropriate controls, are shown in Table 1. The beta weights for each equation are shown in the column headed by each mid-range objective. In the analysis for the size of the applicant pool, the control variable introduced was the size of the district, as indexed by the natural log of enrollment (LNENRL). It was also introduced for the analysis of teacher turnover. In large, urban districts there are likely to be more persons looking for teaching positions than in small, rural ones. In addition the temptation for teachers to leave small, rural districts and move to large, urban ones, thus increasing teacher turnover in the former, was also recognized. The outcomes of the analysis indicated however, that district size, along with education incentive, is an important factor in the size of the applicant pool, but that it is unimportant relative to teacher turnover. The important factors in the latter are BASTEPS and EDUCINC. Both of these variables also show strong relationships to district experience, to which the use of spaced steps in the schedule and the total steps in the schedule are also important. Relative to the major influences on the percent of teachers in a district with the Masters degree, education incentive is clearly the dominant factor, as it should be, while BASTEPS is also a factor. A control

variable, the number of miles a district is from the nearest four year college (MILECOLL), was shown to be an important factor to PCTMA in an earlier study¹, but in this analysis, which is based on data taken five years later, it is a weak contributor.

Table 1 about here

Looking across the columns, it is apparent that the most consistent salary schedule influences on mid-range objectives are EDUCINC and BASTEPS. These variables significantly decrease teacher turnover and increase average teaching experience in the district, thus contributing to district stability, while also increasing the percent of teachers with the Masters degree or beyond. The role of BASTEPS in increasing PCTMA appears to be one of providing a sufficient number of years of reasonable salary support to permit teachers to work toward and obtain the Masters on a piecemeal basis, thus avoiding a large expenditure to obtain it in early career when salaries are low and previous student loans and family expenses may be burdensome.

Relationships of salary schedule to achievement variables. These relationships are shown in Table 2, in which the beta weights for each equation appear in the column headed by each achievement variable. In each of these equations, three control variables were used. The first two, district size (LNENRL) and the percent of white students (PCTWHT) have previously been

shown to be important variables in student achievement in the same population^{2,3}. A third variable, the degree to which instruction in a district was objectives-based (OBJBSD) is very recently been shown to be important to district achievement outcomes⁴, and was introduced as a control in this study to increase statistical precision. Given these control variables, it is apparent in Table 2 that salary schedule variables hold extremely weak direct relationships to achievement outcomes at the district level. The consistent positive relationships of SPCDSTEPS to achievement at each level, while not very strong, are of interest insofar as they suggest the possibility that adding additional steps at the end of the regular schedule may influence teacher performance in some way--perhaps in sustaining teacher effort to help students achieve. Aside from these interesting relationships, the control variables clearly account for most of the variance in each equation.

Table 2 about here

Relationships of Mid-range to Achievement Variables. Table 3 shows the relationships among the variables representing mid-range objectives and control variables to those representing student achievement. An immediately apparent feature of the table is that the results for elementary school are substantially stronger than those for high school. At the

elementary level, two mid-range objectives, district experience and the percent of teachers with the Masters degree, clearly influence achievement in math and reading. The results for the size of the teaching pool are also in the right direction, but not statistically significant. The control variables, LNERNRL, PCTWHT, and OBJBSD are obviously potent relative to elementary school achievement. At the high school level, the control variables, excluding district size, continue to show strong effects, while the effects for the average teacher experience in the district, as seen in the elementary data, disappear completely at the high school level.

Table 3 about here

The results for the influence of PCTMA at the high school level are consistent with those at the elementary level, but attain statistical significance only in reading. The weak effect for PCTMA on high school mathematics is probably traceable to the severe shortage of math teachers between 1981 and 1986 and to difficulty in retaining them, once employed, for substantial periods of time. The generally weak effects at the high school level do not necessarily mean that mid-level objectives have no effect on achievement there. An important problem in the analysis of high school achievement data is that

unique variables such as the percent of high school students who take math in grade 10 or the presence of special reading instruction in grades 10, 11 and 12 may strongly influence achievement⁵ just as objectives-based education does. Ability to control all such variables has a significant bearing on which variables show as strong or weak when regression analysis is used. Thus at some future time when a still more precise set of control variables can be used than was possible in the present study, the variables representing mid-range objectives may indeed show more strongly at the high school level.

Conclusions

When salary schedule variables are viewed systemically, that is, as means to other ends rather than as ends in themselves, a number of important relationships appear. First, the magnitude of education incentive is significantly related to every middle range personnel objective--a larger applicant pool, reduced teacher turnover, increased experience in the same district, and a larger percent of Masters degree teachers in the district. The steps in the baccalaureate schedule hold similar relationships, except that they have little effect on the applicant pool. Having periodic increments beyond the end of the regular schedule influences district experience as do the total steps in the schedule. Second, and in turn, the percent of teachers with the Masters degree and the average amount of teacher experience in the district are significant determinants

of math and reading achievement in the elementary school. Periodic increments beyond the regular schedule also influence achievement at the elementary school level, perhaps through the mechanism of sustaining teacher effort as experience increases. At the high school level the percent of teachers with the Masters influences achievement in reading, and may influence achievement in math, as may also having periodic steps beyond the end of the regular schedule. Generally, though, the effects at the high school level are considerably weaker than those at the elementary level.

The overall results of the study firmly support the concept that the variables in salary schedules, as defined in the study, largely do what they are supposed to do. They influence the degree to which middle range personnel objectives are realized, which in turn influences student achievement, especially in the elementary school, and to a lesser degree in high school.

Table 1

Relationship (Beta Weights) of Salary Schedule and Control Variables to
Middle-Range Policy Objectives

Salary Schedules Variables	POOL	Policy Objectives		
		TTURN	DISTEXP	PCTMA
BASTEPS	.13	-.45xxx	.46xxx	.30xxx
SPCDSTPS	-.08	-.06	.21	.00
EDUCINC	.23 ^x	-.30xxx	.33xxx	.48xxx
TOTSTEPS	.05	-.04	-.21 ^{XX}	-.08
Control Variables				
MILECOLL			- -	.17 ^x
LNENRL	.46xxx	-.09	- -	- -
Adj. R ²	.34	.23	.27	.31

^xp=.10 ^{xx}p=.05 ^{xxx}p=.01

Table 2

Relationship of Salary Schedule and Control Variables to Achievement

	Reading Grades 5/6	Achievement Math Grades 5/6	Reading Grades 11/12	Math Grades 11/12
BASTEPS	.15	.09	.01	-.05
SPCDSTPS	.16 ^x	.19 ^{xx}	.11	.13
EDUCINC	.18 ^x	.14	.05	.02
TOTSTEPS	.01	-.07	-.13	.01
LNENRL	-.45 ^{xxx}	-.43 ^{xxx}	.03	.02
PCTWHT	.37 ^{xxx}	.32 ^{xxx}	.48 ^{xxx}	.47 ^{xxx}
OBJBSD	<u>.24^{xx}</u>	<u>.13</u>	<u>.15</u>	<u>.21^{xx}</u>
Adj. R ²	.23	.19	.23	.22

^xp=.10 ^{xx}p=.05 ^{xxx}p=.01

Table 3

Relationship of Middle Range Policy Variables and Control Variables to Achievement

Policy Variables	Achievement			
	IRACH2	IMACH2	HSMACH2	HSRACH2
POOL	.14	.15	.03	.03
TTURN	-.15	.07	.01	.07
DISTEXP	.22xx	.31xxx	.02	.09
MA86	.26xxx	.21xx	.13	.22xx
Control Variables				
LNENRL	-.62xxx	-.62xxx	-.01	-.07
PCTWHT	.47xxx	.41xxx	.52xxx	.53xx
OBJBSD	<u>.27xxx</u>	<u>.18x</u>	<u>.24xx</u>	<u>.19xx</u>
Adj R ²	.32	.28	.23	.24

*p=.10 xxp=.05 xxxp=.01

Footnotes

1. R.L. Turner and G. Camilli, Patterns of Urban vs Rural Expenditures as Antecedents to Math and Reading Achievement (Paper at the annual meeting of the American Education Research Associatin, Washington, 1987).
2. R.L. Turner, G. Camilli, R. Kroc and J. Hoover, "Policy Strategies, Teacher Salary Incentive, and Student Achievement: An Explanatory Model," Educational Researcher, 15 (March 1986): 5-11.
3. C.E. Bidwell and J.D. Kasarda, "School District Organization and Student Achievement," American Sociological Review, 40 (January, 1975), 55-70.
4. R.L. Turner and P. DiStefano, Influences of District-level Reading Specialists on High School Achievement (School of Education, University of Colorado, 1986, mimeo) pp. 1-11
5. Ibid.